USA
ULTIMATE SERVICE ASSOCIATES

The ultimate solution for maintaining your nationwide generator network

The Key to Standby Generator System Reliability: Planned Maintenance

1.0 Introduction

Many customers can incur catastrophic losses should they lose utility electrical power, even for a short time. Standby generator systems provide a source of reliable and uninterruptible power during such outages. Hospitals, data centers, agricultural, etc. are highly dependent on standby power services.

This Information Sheet discusses the best industry practice maintenance programs to maintain the generator systems in a state of readiness after between extended periods of no interruption of power.

2.0 Planned Maintenance - The Key to Generator Reliability:

Whatever the industry, the key to having back-up power available and operating reliably during outages, is a planned maintenance program. While most standby generators incorporate an automatic set exerciser to start and run the generators for 30-minutes, such as once a week, only a planned maintenance program undertaken regularly will ensure reliability of the complete system.

3.0 Who Should Carry Undertaken Planned Maintenance:

Principal generator set manufacturers have established a nationwide network of distributors staffed with service and maintenance personnel trained on generator set systems. Service technicians, in addition to being trained on the equipment, follow the maintenance procedures as recommended for standby generator systems by bodies such as NFPA, NEMA and GSA.

Untrained and inexperienced operators frequently fail to identify problems that can result in failure that an experienced service technician is trained to detect. In a planned maintenance (PM) program trained service technicians make regular checks to minimize the likelihood of a failure during a power outage. A PM program ensures the generator system is maintained in a state of readiness. Trained service technicians carry out service as laid down by governing bodies and the manufacturer. *(Continued over)*

Key Points to Monitor/Maintain for Standby Set Reliability

General Inspection
1 - Exhaust
2 - Fuel lines/filters/fittings
3 - DC electrical systems batteries

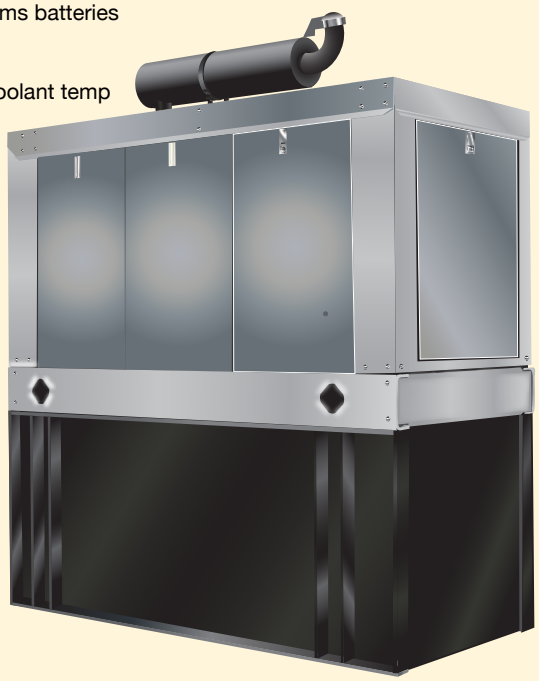
Engine
4 - Fluid levels
5 - Oil pressure and coolant temp
6 - Exhaust smoke

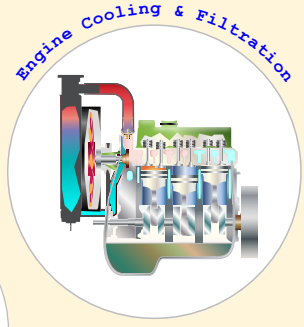
Cooling Systems
7 - Water pump
8 - Radiator fins
9 - Leakage
10 - Belts

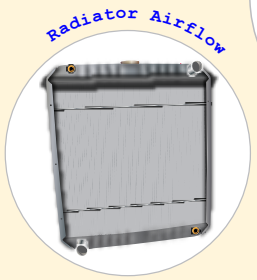
Fuel Storage
11 - Contamination
12 - Leaks

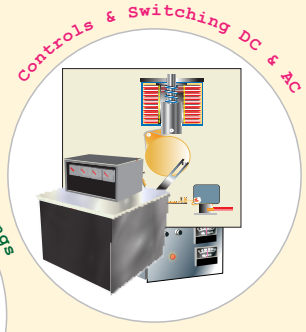
Filtration
13 - Fuel filter
14 - Oil filter
15 - Air cleaner

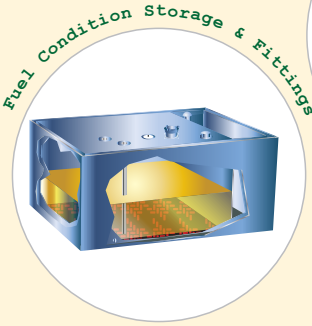
Switch Gear
16 - Battery charger
17 - ATS
18 - Control panel











To fulfill our commitment to be the leading network service provider in the Power Generation Industry, the USA, Inc. team maintains up-to-date technology and information standards on Power Industry changes, regulations and trends. As a service, our **Information Sheets** are circulated on a regular basis, to existing and potential Power Customers to maintain awareness of changes and developments in engineering standards, electrical codes, and technology impacting the Power Generation Industry.

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4.0 Frequency of Maintenance:

The following factors influence the frequency of maintenance within a planned maintenance program:

Application - Critical applications are subject to codes such as NFPA110 that recommend a higher frequency of maintenance. Operators and users of systems should check the status of their application.

Location - Factors such as altitude, humidity, salt-laden atmosphere, extreme heat and cold, dust, etc. are all factors that can affect the life of a system. Manufacturers recommendations for operating in different environments should be followed.

5.0 Systems Component Checks within a Planned Maintenance Program:

Most service providers will carry the necessary replacement parts, oil and fuel on their service truck. They also normally will have many other items that could be needed which will save time and transportation – hence cost.

A generator system includes many electrical and mechanical components, all of which have to be checked as follows:

Exhaust system - With set running, inspect the entire exhaust system including the exhaust manifold, muffler/silencer and exhaust piping. Check for leaks at all connections, welds, gaskets and joints, making sure that exhaust pipes are not heating surrounding areas excessively. Any leaks should be repaired immediately.

Fuel System - With the unit running, inspect the fuel supply lines, return lines, filters and fittings for cracks or abrasions. Make sure the lines are not rubbing against anything that could cause eventual breakage or failure. Repair any leaks and reroute the lines to eliminate wear immediately.

Engine - Monitor all fluid levels, oil pressure and coolant temperatures frequently. Most engine problems give an early warning so look and listen for changes in engine performance, sound, or appearance that may indicate that service or repair is needed. Be alert for misfires, vibration, excessive exhaust smoke, loss of power or increases I oil or fuel consumption.

Lubrication system - In prime power applications where the engine runs continuously, the engine oil level with set shut down should be checked daily (For an accurate reading, the generator should be run and after sufficient time to warm through, shut down and allow the oil in engine's upper regions to drain back into the crankcase (about 10 minutes). The oil level on the dipstick should be at or near to the 'full' mark. If needed, top up with the same quality, brand and viscosity of oil as recommended by the manufacturer for the ambient site conditions. Oil analysis is a good way to determine the state of the oil and can indicate certain potential problems.

The oil and oil filter should be changed every six months, regardless of hours operated. Used oil and filters must be disposed of properly to avoid any environmental damage or liability.

Coolant system - The coolant level should be checked regularly and maintained at the correct level. This solution should have a balanced mixture of water, antifreeze and additives as recommended by the engine manufacturer. Also the coolant heater (if fitted) should be checked to ensure it is working correctly. The cooling fins of the radiator must be kept free of obstructions and all dirt or foreign material removed with a soft brush or cloth, taking care to avoid damaging the fins.

It is important to check that the radiator fan belt is not frayed, cracking or lacks the correct tension.

Fuel system - Diesel fuel is subject to contamination and deterioration over time. As diesel fuel in a sub-base of a standby generator tank is rarely consumed completely, tests should be conduced at regular intervals.

Water vapor accumulates and condenses in the fuel tank, so must be drained along with any sediment periodically. The tank should be kept full and topped off at all times. Tests will indicate if fuel treatment is necessary using additives that fight micro-organism growth, prevent gelling, boost fuel Cetane levels, disperse contaminants and give added lubrication. Contamination testing will indicate water presence and sediment in the bottom of the tank, and will verify distillation and Cetane levels thus meeting ASTM standards required to comply with NFPA 110 8.3.8. Also test results will show the gel, flash and cloud points of the fuel and so set performance will be as designed. Fuel "polishing" can remove any water, contaminates and sediment from the tank. Fuel filters should be changed every six months or earlier if required.

Air Intake Components - All piping and hoses should be inspected weekly for leaks, holes, cracks, or loose connections. Filters must be cleaned regularly and their seals checked and replaced, as determined by the site conditions and manufacturers recommendations.

Starter Battery and Charger - Batteries are the most common cause of standby sets failing to start. Battery condition will be checked using a meter and taking a sample of the electrolyte. If the battery cannot hold charge it will be replaced. Battery terminals must be kept clean and dirt free. Charger operation will be verified.

Automatic Transfer Switch (ATS) - The ATS should be checked carefully on a regular basis to ensure its proper operation. It must be maintained in a clean state and any dust, dirt or other contaminates removed with a clean dry cloth, brush or vacuum. The contacts should be checked annually using an infrared ray gun or infrared camera to ensure there are no hot spots.

Load Banking - The only true way to check generator performance is to apply rated load for a minimum of 2-hours. As part of a PM program, if sufficient load is not available, a portable load bank can be connected to the generator. NFPA 110 Level 1 installations call for testing under load (minimum 30% nameplate rating) for four-hours every three-years.

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